PROC. BIOL. SOC. WASH.
100(3), 1987, pp. 584–589

STUDIES IN THE *LEPIDAPLOA* COMPLEX (VERNONIEAE: ASTERACEAE). II. A NEW GENUS, *ECHINOCORYNE*

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Abstract.—The genus *Echinocoryne* is established for a group of Brazilian species related to the genus *Lepidaploa* in the "rhizomatous" form of the columellae in its lophate pollen. The new genus is characterized by its large number of slender involucral bracts and its pedunculate heads. The genus is also notable for its densely sericeous pubescence and poorly differentiated style base.

The present paper is one of a series of five devoted to the particular problem of refining generic limits in the neotropical *Lepidaploa* relationship of the Vernonieae. *Echinocoryne* is one of three genera in the complex showing a specialized pollen that is unique to the group. The first of the genera treated, *Stenocephalum,* a small genus of Central of South America south to Argentina, is distinguished by heads with few flowers and by pollen with some extra areoles (Robinson, 1987). The present genus, *Echinocoryne* is also small, but is restricted to Brazil. Another paper will deal with the small *V. brachiata* and *V. scorpioides* groups. The two remaining papers in the series will deal with the two larger elements of the complex, one being on *Lepidaploa* itself with a fuller discussion of the basic pollen form of the complex.

The species of *Echinocoryne* have been placed together in some previous treatments. Baker (1873) placed them in his *Vernonia* catagory Lepidaploae Paniculatae I. Oxylepidae, while Jones (1979) placed them in *Vernonia* as a new series *Subulatae* under his subsection Nudiflorae. The Baker treatment included two additional species in the group. The first, *V. foliosa* Gardn. with its strikingly different Lychnophorine habit and *Proteopsis*-like heads, seems from photographs to have no close relationship. The second, *V. virgulata,* was also retained by Jones in his series *Subulatae.* The latter species has some resemblance to *Echinocoryne* in its sericeous indument and variably short-pedunculate heads, but differs in the aspect of the short-tipped multiseriate involucral bracts. The number of bracts is approximately 40 in head compared to ca. 10 flowers, a ratio approaching but not equalling that in *Echinocoryne.* In addition, the stems are distinctively grooved, receptacles setiferous, corollas have more hairs on their lobe tips, carpopodium has a different shape, while the upper achene and corolla have larger short-stalked capitate glands of a form not seen in *Echinocoryne.* The pollen differences are cited below. The overall impression is one of a remote relationship elsewhere in the *Lepidaploa* complex.

The only species included here that was not covered in the previously mentioned works is *V. echinocephala* H. Robinson which has been described since those works (Robinson 1980).

Significant Characters

Pubescence.—The vegetative parts of *Echinocoryne* are notable for their sericeous pubescence. Such hairs occur to the exclusion of evident glandular punctations. The

density of the hairs varies from the sparse form seen in the more herbaceous *E. subulata* to the usually dense, sometimes silvery sericeousness of parts of the other species. The pubescence is most dense on the undersides of the leaves, but is often nearly as thick on the upper side without obscuring the darker color of the leaf surface. The hairs are shorter but often very dense on the involucral bracts. In contrast, the corollas have less hairs than those of many other species in the Vernonieae. The corollas are nearly glabrous, except at the tips of the lobes, in all the species. In *E. subulata* even the tips of the lobes have no hairs, just the few characteristic minute glands found in all the species.

Pedunculate heads.—The heads of *Echinocoryne,* with rare exceptions, are all pedunculate; however, the length of the peduncles varies. The peduncles are longest in the herbaceous *E. subulata* and subshrub *E. echinocephala,* but are short in typical *E. holosericea* and *E. schwenckiaefolia.* The length seems consistent in the first two species, but in the latter two seems to be variable. The longest peduncles in the genus seem to be generally associated with larger heads, but the correlation breaks down in forms with shorter peduncles.

Involucre.—The graduated bracts of the involucre in *Echinocoryne* are all similar in their general form and show no differentiation of the type seen in many *Lepidaploa.* They have minimal differentiation of the largest inner bracts. All the bracts are linear-lanceolate with narrowly pungent almost setiform tips. The appearance of the involucre is characteristically echinate.

The most significant aspect of the involucre compared to *Lepidaploa* is the ratio of the bracts to the flowers. The example with the largest numbers, *E. echinocephala,* has 400–500 bracts with ca. 50 flowers in a head. The number of bracts may be as great as any in the tribe, and the ratio of bracts to flowers is larger than any in the tribe except those with three or less flowers in a head. The stability of the usually 2:1 or 3:1 ratio in the large genus *Lepidaploa* seems significant, and the striking exception to that ratio in *Echinocoryne* is therefore also considered significant.

Style base.—In all of the species the base of the style has a few rows of sclerified cells on the part that is immersed in the top of the nectary, but no enlargement of the type seen in *Lepidaploa* has been seen in any of the species of *Echinocoryne.*

Achene.—The achene is densely and sericeously setuliferous without any intervening glands or uniseriate hairs. The five weak ribs of the surface are completely obscured by the setulae. The carpopodium is somewhat unusual in its turbinate form which is constricted above. The incurved upper surface is further distinct for the number of setulae borne as low as the broadest part of the carpopodium, well below the level of the uppermost margin of the structure. Although the differentiated carpopodial cells do not occur directly above such setulae, but only between them, the impression is nevertheless that the upper incurved third of the carpopodium is setuliferous.

Pollen.—*Echinocoryne* has lophate pollen grains with a "rhizomatous" columellar structure under the crests (Figs. 1–6). The pollen in the group was classified as type B by Jones (1979), which it is in the broad sense of having colpi continuous to the poles. That classification has proven much too broad, however, because it includes phyletically significant variations. The type B of Jones is approximately the same as that called the *Vernonia argyrophylla* type by Stix (1960). The type, as represented by the latter species, was erroneously regarded by Stix under her general *Vernonia* category which she showed in a drawing with the structure here called "rhizomatous." The type B based on *V. argyrophylla* is not rhizomatous, and it tends to be larger in size with three areoles equatorially across the intercolpar region. The *Echinocoryne* pollen has only two intercolpar rows of areoles (Figs. 1–3) and has

rhizomatous structure (Figs. 5, 6). It is a type more often seen in the genus *Lepidaploa*. The grains seem distinct from similar forms in *Lepidaploa* in only one possible way, the manner in which the rhizomatous columellae peel away from the foot-layer leaving slightly raised ridges but no clear scars (Fig. 4).

Vernonia virgulata which was placed with species of *Echinocoryne* by both Baker (1873) and Jones (1979) actually does not have the type B pollen designated for it by Jones. The type is technically C with polar areoles, but the grains are distinct from any other type C grains by the non-rhizomatous columellar structure of the crests and the frequent extra areole in the middle of the intercolpar region. The pollen is regarded here as closest phyletically to the type B as seen in *V. argyrophylla* although it has a different areolation. The pollen structure tends to reinforce the impression gained from other characters that *V. virgulata* is only remotely related to *Echinocoryne*.

Relationships

A phyletic position of *Echinocoryne* can be proposed if one accepts certain conclusions regarding the characters analyzed above. The specialized rhizomatous crests of the pollen place the genus in the immediate relationship of *Lepidaploa* in which such complex pollen is unique. Since the bract/flower ratio of *Lepidaploa* extends more widely than the rhizomatous pollen character, then the departure from that ratio in the small genus *Echinocoryne* seems derived in the more immediate ancestry of that genus. The pedunculate condition of the heads is not found in *Lepidaploa* but is found in what appears to be its nearest outgroup. Consequently, a position for *Echinocoryne* from near the basal stock of *Lepidaploa* might be possible. It is also possible that the pedunculate condition is a reversion and that the genus is a more recent derivative of *Lepidaploa*. However, no species in the latter genus seems a likely candidate for close relationship.

As indicated, the genus dealt with here is well-marked in its habit, and the characters violate the character limits by which all the most closely related genera are most effectively defined. Furthermore, a phyletic position outside of the immediate *Lepidaploa* generic clade seems possible. The name *Echinocoryne,* meaning hedgehog or prickly club, is particularly suitable for the pedunculate heads of the plants with their many spiny involucral bracts.

Echinocoryne H. Robinson, gen. nov.

Plantae herbaceae perennes erectae ad 2 m altae vegetative laxe ramosae, in caulibus foliis et bracteis involucri dense albo-sericeae. Folia alterna sessilia vel subsessilia linearia vel oblonga margine integra anguste reflexa apice acuta et minute apiculata subtus pallidioria non glandulifera. Inflorscentiae diffusae in pedunculis leniter vel arcte elongatae. Capitula late campanulata; bracteae involucri super-abundentes dense subimbricatae graduatae ca. 110–500 et 6–9 seriatae patentes vel erecto-patentes lineares apice longe punguntes. Flores 15–60 in capitulo; corollae lavandulae in partibus majoribus glabrae in lobis subapice pauce spiculiferae et minute glanduliferae; cellulae endotheciales in scutis scleroideis radiatae vel curvatae, nodis multifidis; appendices antherarum non glanduliferae; basi stylorum noduliferi. Achaenia longe setulifera, costis 5 indistinctis in setulis dense obsitis, setulis perdensis strictis sericeis, cellulis intercostalis raphides elongates continentibus; carpopodia turbinata in partibus superioribus setulifera; setae pappi interiores capillares persistentes ca. 30, squamae pappi exteriores lineares. Grana pollinis in diametro ca. 50 μm valde lophata *Lepidaploa*-forma (subtypus E).

Type species. — *Vernonia holosericea* Mart. ex DC.

A number of names have been proposed

for various entities in the genus *Echinocoryne,* but the name *V. subulata* has represented the only obviously distinct species besides the type. The other members of the genus have seemed comparatively alike, and the name *V. holosericea* has been applied widely to them by myself and others. Contrary to the superficial appearances, the present study has shown that all the available names in the genus correlate with distinguishable species having distinctive geographical distributions.

Key to the Recognized Species of *Echinocoryne*

1. Plants laxly herbaceous with pale green membranaceous leaves and yellowish-green stems, leaf blades broad, plane or with scarcely recurved margins, with sparse flexuose hairs; peduncles long and flexuous ..... *E. subulata*
– Plants more stiffy herbaceous to suffrutescent with darker leaves and stems, leaf blades narrow or broad with distinctly recurved margins, with dense hairs on at least under surface; peduncles strict and often short 2
2. Heads few or solitary on peduncles 7 cm long or longer; leaves lanceolate with densely whitish sericeous undersurface ..... *E. echinocephala*
– Heads usually numerous in complex inflorescences; peduncles usually 4 cm or less long; leaves linear to oblong with sordid or grayish pubescense on undersurfaces 3
3. Leaves mostly broadly elliptical to oblong ¼ to ½ as wide as long, often velvety pubescent beneath ..... *E. schwenkiaefolia*
– Leaves narrowly lanceolate to linear, less than ¼ as wide as long, with pubescence beneath variable but not velvety 4
4. Heads with 30–60 flowers, 12 mm or more high at maturity ..... *E. holosericea*
– Heads with 15–21 flowers, 8–10 mm high at maturity 5
5. Involucres pale yellowish; upper leaves abruptly terminating in narrowly obtuse apices ..... *E. stricta*
– Involucres tinged with red; upper leaves tapering to narrowly acute apices ..... *E. pungens*

The species recognized in the genus are as follows:

Echinocoryne echinocephala
(H. Robinson) H. Robinson, comb. nov.

Vernonia echinocephala H. Robinson, Phytologia 45:173. 1980. Southern Goias.

Echinocoryne holosericea
(Mart. in DC.) H. Robinson, comb. nov.
Figs. 1–6

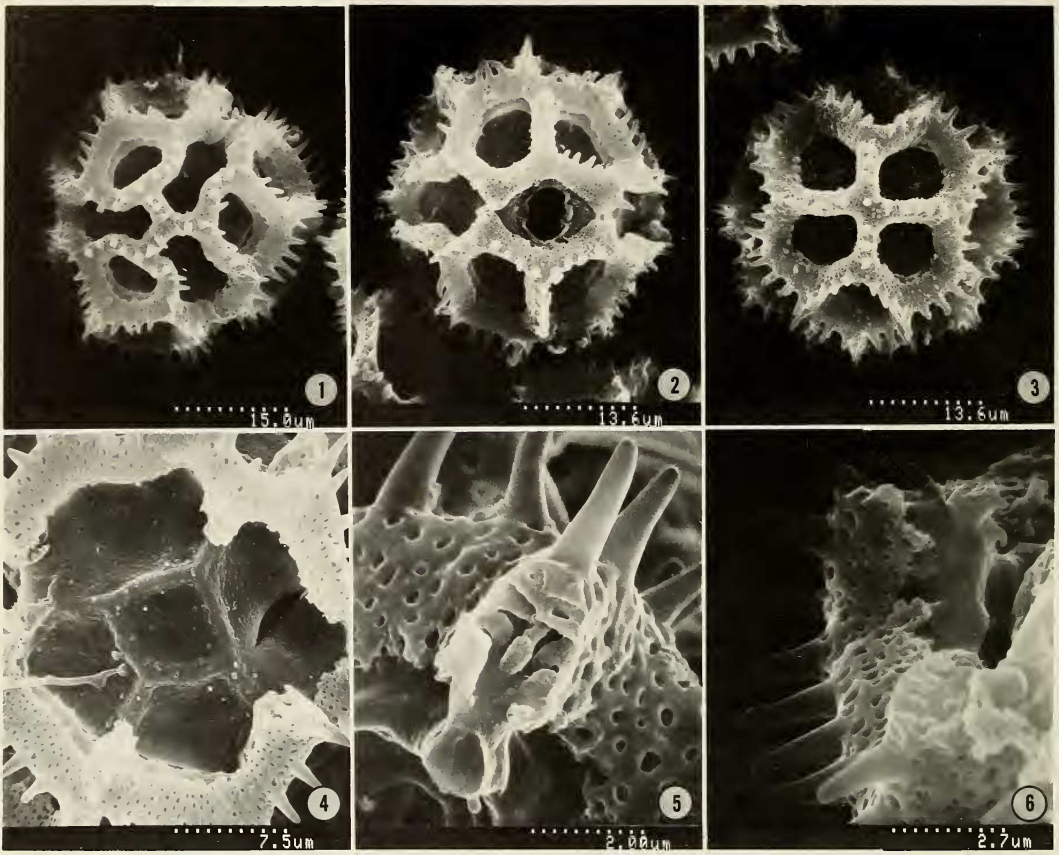
Vernonia holosericea Mart. in DC., Prodr. 5:43. 1836. Bahia, southern Maranhao, northern Minas Gerais.

Echinocoryne pungens
(Gardn.) H. Robinson, comb. nov.

Vernonia pungens Gardn., London J. Bot. 6:418. 1847. Southern Goias, western Bahia, western Minas Gerais, Distrito Federal. Examination of an isotype (US) shows that neither the odd statement of 4–5 flowers by Gardner (1847) nor the 30–40 flowers in the head claimed by Baker (1873) is correct. The number seems to be ca. 20, essentially the same as that in *E. stricta* which has heads of about the same size. The involucral bracts are generally less longly attentuate than in the other species.

Echinocoryne schwenkiaefolia
(Mart. in DC.) H. Robinson, comb. nov.

Vernonia schwenkiaefolia Mart. in DC., Prodr. 5:44. 1836. Minas Gerais, south-



Figs. 1–6. Pollen of *Echinocoryne holosericea* (Martius in DC.) H. Robinson, dotted lines of 1. = 15 μm, 2, 3. = 13.6 μm, 4. = 7.5 μm, 5. = 2 μm, 6. = 2.7 μm. 1, Polar view showing convergence of colpi; 2, View of colpus (transverse); 3, View of intercolpar region showing characteristic two rows of areoles; 4-6. Broken grains. 4, View showing nearly unscarred foot-layer with crest removed; 5, Crest in section showing "rhizome" and structure of perforated tectum; 6, Lateral view of crest showing weak basal attachment of "rhizome."

ern Goias, southern Bahia. The species is rather consistent in its broad short leaves but is more variable in its heads. The latter range from nearly as pale as *E. stricta* to as dark as *E. holosericea,* but the mature heads are mostly in the size range of the latter species with 25–45 flowers.

Echinocoryne stricta
(Gardn.) H. Robinson, comb. nov.

Vernonia stricta Gardn., London J. Bot. 5: 219. 1846. Southern Minas Gerais, São Paulo. The small pale involucres are very noticeable, especially in contrast to the rufus pappus and the reddish corollas.

Echinocoryne subulata
(Baker) H. Robinson, comb. nov.

Vernonia subulata Baker, Fl. Bras. 6(2):108. 1973. Southern Goias, central Minas Gerais.

Acknowledgments

The pollen specimens were prepared by Mary Sangrey using facilities of the Botany Department Palynological Laboratory. The photographs were prepared by Suzanne Braden of the Smithsonian Museum of Natural History SEM Laboratory using a Hitachi 570 scanning electrom microscope.

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